The Chemical Age

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Arc Welding

THE art of the welder is ubiquitous. In every type of plant the welder is replacing the riveter in part if not in whole, and the use of X-rays for examination of welds is making for greater safety in what is pre-eminently a type of work in which the human factor plays a great part. Examples of welded pressure vessels are to be seen throughout the chemical industry. James F. Lincoln, whose name will be remembered for long in the welding industry, has referred to welding as "an ingenious process which has great economic, social and commercial significance to mankind." The art of the welder consists in so fusing two pieces of metal together that the weld is as strong as the metal on either side of it. Differences in composition there must be for it is impossible to heat-treat iron and steel in this way without changing the structure fundamentally; these changes, however, may often be minimised by heat treatment subsequent to the welding, though there are occasions, such as a large welded tank or a welded steel structure, when this cannot be done. A welding foundation has been set up to commemorate J. F. Lincoln, with the general object of stimulating scientific interest, study, research and development in arc welding through advance in the knowledge of design of welded plant, and to further the practical application of welding. The first activity of the Foundation has been to award prizes for papers on welding, and a volume of some 1,400 pages has just been published containing 109 papers that received awards. Among them one is pleased to notice five papers from this country.

The developments of welding within the past few years can be visualised from these papers. One notices, *inter alia*, that a great number of all-welded ships have been constructed for inland navigation. Welded boilers for the steam heating of aeroplanes, and welding for other parts of aircraft, all-welded goods waggons, welded furniture, together with almost limitless applications in the welding of machinery, and for structural work of nearly every variety.

The application of welding to manufacturing plant is of primary interest to the chemical industry, and several examples are given though not of very pronounced importance. The use of stress-relieved welded columns for distillation in the oil industry under high pressures is well established. It is believed that welded casings will be adopted for oil wells, just as welded pipes are already used for water boreholes. An interesting point is the development of the welded boiler. Two British authors, Messrs. Ferguson and Burford, remark in their paper upon the difficulties encountered with insurance companies and the authorities in the U.S.A. and Great Britain in obtaining authorisation and acceptance of welded boiler drums. Four welded evaporators are described which are claimed to be the largest welded pressure vessels so far made to Lloyds Class I code; these were designed for a pressure of 250 lb. per sq. in. on 11 ft. diameter with a total height of some 27 ft. It is maintained that a welded boiler has several advantages over the riveted construction such as much less piercing of the shell thus reducing the possibility of trouble with leaking rivets, less trouble with embrittlement of plates adjacent to rivet holes where the metal has been hardened, stress-relieving to 650 deg. C. (which is not practised with riveted boilers) and saving in cost. These advantages are put forward in support of the all-welded boiler; doubtless the adherents of the riveted boiler could produce a similar list in support of their design. Rightly or wrongly, insurance companies are not yet convinced that the welded boiler should be encouraged, though there is little doubt that it will come in the future, since the technique of welding is being rapidly advanced. Without the application of welding, the thimble-tube boiler could never have been brought to economic development according to another British paper presented by Mr. E. F. Spanner; this boiler is used primarily for recovery of waste heat from Diesel engine exhausts, but has wider applications especially in the recovery of waste heat.

Although this symposium was primarily devoted to arc welding it must not be forgotten that there are many other types of welding which have equally wide applications. The scientific aspect of joining metals by fusion must not be forgotten for it leads to some very pretty problems in metallography. There is no doubt that vessels that have been welded must be stress-relieved if they are to be used at high pressure. Very few firms in this country, if any, have welding plant and stress-relieving furnaces of the scale used in the United States of America, and there is little doubt that, even though we have individual specialists of high repute, America is in front in the application of welding to plant.

> *"Welding by means of one or other of the modern processes is now recognised as a legitimate method of construction having in many cases definite advantages, both in economy and efficiency, over old-established practices in the manufacture of engineering plant."*
>
> —*Mr. H. N. Pemberton, A.M.I.N.A.*

NOTES AND COMMENTS

Employment in the Chemical Industry

IT has always seemed that the employment of chemists is a singularly haphazard process. A man settles down in whatever post he can secure. Sometimes he stays there, but often he moves from post to post to gain experience. Lack of attractiveness of the work he is given to do, or of the salary he is paid, or of the prospects, too often cause useful chemists to turn to other occupations. As a case in point, a young chemist stayed in one particular industry for years and finally rose to be undermanager of his works. His qualifications prevented him from going farther, and his experience was limited to that one industry. He turned away from chemistry to become a salesman; in this he was unsuccessful and by the time he had realised that salesmanship was not his metier, he had so far fallen behind in the chemical profession that he could not get back. The American chemical industry has recently set up a Chemists' Advisory Council which will provide a clearing house for posts and advice for the young chemist and for the older chemist who is unemployed. Is it not time that chemists became sufficiently united in this country for something of the sort to be possible here?

Atmospheric Pollution by Chemical Works

THE subject of atmospheric pollution is never out of the technical or, for that matter, of the daily Press for long. It has been raised again by Mr. James Law, the chief sanitary inspector for the Sheffield, Rotherham and District Smoke Abatement Committee in a paper read by him before the Health Congress of the Royal Sanitary Institute. It is admitted that pollution from domestic sources is the most intractable, but attention is specifically directed to the coke oven industry. Mr. Law goes so far as to say that though some of the 18 coking plants in the Sheffield district are modern, all of them cause anxiety with regard to air pollution. He blames the gases generated during the charging of the ovens, and although few coking plants are in congested areas, the smoke, it is claimed, is carried to those areas by the wind. The smoke abatement enthusiasts have to attack along a very wide front, for there can be few industries that do not raise a dust, fume or smoke that pollutes the atmosphere occasionally. So far as coke ovens are concerned, the smoke abatement bodies seem to be beating the air. Instead of expressing grave anxiety in regard to the present state of affairs, would it not be better to consider the enormous change for the better that has taken place, and to congratulate the industry on what has been achieved. Anyone who has known the days of the bee-hive oven would consider even the least efficient by-product oven an immense advance in regard to atmospheric pollution. In the early days of the coking industry conditions were such that all inhabitants not compelled by their circumstances to remain therein fled to sunnier climes where they could breathe without being stifled.

Smoke Prevention Devices

THE coming of the by-product oven reduced the period of smoke discharge from continuous emission to about 15 minutes per 30 hours per oven. The modern oven is equipped with smoke prevention devices that shorten the time of smoke discharge and reduce, or all but prevent, visible emission. Self-sealing doors have further improved the situation. No one would imagine that complete smokelessness or complete absence of smell could accompany coal carbonisation or any other type of chemical operation, but only the most fastidious could complain that one modern coke-oven plant is worse than a street of houses in regard to smoke emission. The increase in efficiency in all chemical processes, due perhaps to improved technical training of the operators, has made a vast difference to the amount of atmospheric pollution from chemical works generally. Steel-making was formerly considered a trade wherein smoke emission was inevitable, but Professor Wheeler, the Chairman of the Joint Advisory Smoke Abatement Committee has stated that provided proper plant is used all steel processes can be carried out with a minimum of smoke. He was careful to add, however, that it could not be expected that manufacturers would scrap plant that had cost large sums of money. That is a factor which should be borne in mind. Whenever new plant is installed, care should be taken that it is efficient from every angle, but smoke abatement enthusiasts in their dealings with industry must bear in mind technical and economic possibilities.

Orders Wanted for Steel Helmets

THE Civil Defence Act lays important obligations on owners and occupiers of commercial establishments in vulnerable areas specified in the Act where more than 50 people are employed. It is their duty not only to see that all their employees know what they should do in the event of an air raid, but to ensure that a proportion are trained and equipped in A.R.P. measures. The members of these squads will require steel helmets, but though seven hundred thousand helmets are waiting in Government stores for issue the Lord Privy Seal's Department reports that few orders are coming in for them. Actually only 30,000 have been ordered. The Civil Defence Act became law on July 13 and the Air Raid Precautions' authorities are anxious to receive orders for helmets at the earliest possible moment. Arrangements have been made for their supply by the Government through a joint committee of employers representing all sections of industry.

Cyanide Discovery Recalled

FIFTY years ago the gold mining industry in South Africa was extricated from a precarious position by a young Scottish chemist's discovery of a cyanide process for increasing the extraction of gold from the ore. John Stewart MacArthur was the chemist and associated with him in his experiments were two brothers, Dr. Robert and Dr. William Forrest. To-day, their memory is to be honoured by the foundation of a research fellowship in their name by the Chemical, Metallurgical and Mining Society of South Africa. MacArthur's discovery was made after many experiments. He and his colleagues found that a remarkably complete extraction of gold was obtained by passing a weak solution of cyanide of potassium through the ore. This dissolved out the gold, which was then precipitated by passing the cyanide, which now held the gold in solution, through zinc filings. The gold was deposited on the zinc, leaving the cyanide free to be used again. The first plant was installed in New Zealand. It was successful, but South Africa was the scene of the most sensational results from the cyanide process. Gold mining had been proceeding for some time on the Rand, but the industry was in a very precarious condition, only one of the then existing mines being in a position to pay a dividend. With the methods then employed the extraction of gold was round about 70 per cent. of that in the ore. The cyanide process increased this extraction to 95 per cent., and the extra 25 per cent. saved the industry.

Industrialisation of Turkey

OUR alliance with Turkey and the publicity given to the Turkish steelworks which were built mainly by British labour and with British products, must have turned the thoughts of many to the prospects of business in that country. A report on the subject published by the Department of Overseas Trade indicates that agriculture is and must remain the basis of Turkish economic life, since some 75 per cent. of the population are peasants and attached to the soil. With the increasing tendency to introduce more scientific farming methods, there should be an increasing market for fertilisers. Industrialisation, however, is proceedng apace and is well up to schedule. There is no unemployment in Turkey and there is actually a scarcity of labourers, a fact which is handicapping industrial production. Wages are consequently rising and no doubt the time will come, as it has come here, when rising wages and the march of civilisation, bringing with it many wants which can only be satisfied in the towns, will draw the peasants from their fields and lead to general industrialisation.

X-ray Testing of Welds

IN our leading article this week space is devoted to the importance of welding and it is pointed out that for many plant jobs, welding is a source of some anxiety because of the difficulty of testing the work. The July issue of *Chemical and Metallurgical Engineering* contains a description of a portable X-ray machine that enables welding to be X-rayed in position. The frequency with which chemical equipment such as high-pressure pipes have to be welded in postiion renders this machine of considerable interest. The X-ray testing of welds depends upon the fact that if a lead-backed film holder is placed on one side of a weld, and the X-ray tube on the other, the intensity of radiation through holes, slag and other defects is greater than through the denser weld metal, the differences being shown on the film.

NATIONAL SERVICE

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Letters to the Editor

Large Industrial Units

SIR,—Lord McGowan has every reason to be proud of the great organisation which he controls in our industry, but there is another side to his view of the future, quoted in THE CHEMICAL AGE last week. "Big battalions" have obviously come to stay, but their importance must not blind us to the still more vital function of the small business unit in our economic life. Hundreds of successful firms, including some of the biggest in the country, owe their origin to the initiative of individuals who were dissatisfied with their existing employment and decided to launch out on their own.

The urge for independence is an even stronger factor than the monetary reward; many people would rather be their own masters on a small income than be employed by another on a higher scale. As a Spanish proverb wisely says, "It is better to be the head of a mouse than the tail of a lion." New ideas and experiments can be tried out more quickly when only one or two colleagues have to approve, than when decisions have to be sought from the numerous persons responsible for a big concern. I know from experience the strength of tradition, and the difficulty which even senior members of a large firm may encounter in making departures from accepted practice.

As the chairman of I.C.I. refers to the "valuable place" of the smaller business in industrial development, he would probably agree with these views. The danger is, however, that the stress of foreign competition and of defence measures may lead to legislation restricting the small unit—a course which would be contrary to our ideals of freedom, and against the best interests of the country. The advantages of competitive enterprise are reflected in our export trade. Statistics published by the League of Nations show that Germany's exports fell last year by a greater percentage than our own—for eleven months the decline was 10.4 and 10.2 per cent. respectively—in spite of her "organised" and subsidised trading. There may be a case for more active measures to assist British trade, but let us not make the mistake of supposing that the large unit is necessarily more efficient or remunerative than the average small business, by which our greatness as a trading nation has been built up.—Yours faithfully,

Bradford. J.B.

August 9, 1939.

Chemical Matters in Parliament

Development of Substitute Fuels

FOLLOWING a statement made in the House of Commons last week by the Secretary for Mines (Mr. Geoffrey Lloyd) with regard to arrangements for the maintenance of petrol and oil supplies in war time, Mr. Greenwood asked for an assurance that investigations into the wider use of substitute fuels were in an advanced stage now. He also asked whether it would be possible, in the event of supplies being needed, for information to be given that those supplies would become an important contributory factor in the supply of petrol and other fuels at home.

Mr. Lloyd: Yes, Sir. It would not be in the public interest to go into details in this matter, but I can say that good progress is being made. The investigations are proceeding along a number of different channels and we hope these supplies would make a substantial contribution to the petroleum requirements in war time.

Mr. Shinwell: Does the scheme provide for the installation of plant to produce oil from coal?

Mr. Lloyd: No, Sir, not in addition to the existing plants.

Mr. G. Nicholson: Has the Minister considered the desirability of building up a reserve of producer-gas vehicles or vehicles adapted to producer-gas?

Mr. Lloyd: All those matters are under consideration.

OXYHALOGEN ACIDS

Their Application to Volumetric Analysis

THE use of oxyhalogen acids in volumetric analysis is discussed by Mr. R. L. May in an abstract of a thesis submitted for a degree of doctor of philosophy in chemistry at Illinois University. He states that the application of iodates and bromates to analytical procedures has been extensively studied, and many uses of these reagents have been proposed. Recently a new reagent, sodium chlorite, has been introduced as a volumetric oxidising agent. (Jackson and Parsons, *Ind. Eng. Chem.*, Anal. Ed. 1937, *9*, 14.) To contribute to the present knowledge of the uses of oxyhalogen acids in volumetric analysis, a study into the further applicability of this reagent was instigated. With it, some modifications of well known bromate methods were investigated.

Chemistry of Chlorites

Researches on the chemistry of the chlorites have been carried out for many years, especially by G. R. Levi and coworkers. However, the introduction of the use of chlorites into analytical chemistry was made only recently by Jackson and Parsons in a method for the determination of sulphites in sulphite liquors. They found that solutions of sodium chlorite were stable for long periods of time when protected from light. While chlorites may show many reactions very similar to those of iodate and bromate in hydrochloric acid solutions, the use of mercuric ion as a catalyst is not possible because of the fact that the reduction product of the chlorite is chloride ion, and this will not be complexed by the mercuric ion as is the case with iodide or bromide ions. Also, the reactions of chlorite are much slower than those of bromate or iodate. The determination of iodine was carried out by a reaction analogous to that of Andrews (*J. Am. Chem. Soc.*, 1903, *25*, 756).

$$2HI + HClO_2 \rightarrow 2ICl + 2H_2O.$$

The reaction is quantitative when the acidity is from 4M to 6M in hydrochloric acid. The endpoint may be observed by potentiometric measurement, the electron-beam sectrometer, chloroform layer method of Andrews or the indicators of Smith and Bliss (*J. Am. Chem. Soc.*, 1931, *53*, 2,091). The presence of one gram of potassium bromide did not interfere. This titration may be applied to a great many reactions in which materials are preoxidised using iodine monochloride, and the iodine liberated is oxidised by a standard solution of sodium chlorite.

The determination of arsenic and antimony has been carried out under conditions similar to the corresponding bromate and iodate methods. The titration must be carried out in hydrochloric acid which is at least 5M. The reaction may be followed using the conventional potentiometer, the electron-beam sectrometer, or the same indicators as in the previous determination. This reaction makes it possible to use pure arsenic trioxide to standardise solutions of sodium chlorite, and this has been done.

Determination of Copper

The determination of thiocyanate ion and through it the determination of copper has been made. This determination was made by Jamieson (*J. Amer. Chem. Soc.*, 1908, *30*, 760) using the Andrews reaction for potassium iodate. Levi states that chlorite oxidises thiocyanate but gives no quantitative data. The titration must be carried out in 60 per cent. by volume of concentrated hydrochloric acid to be quantitative. The addition of 10 ml. of 0.005M iodine monochloride makes the endpoint sharper, but does not permit reduction of the acidity. Preoxidation of the thiocyanate may be made with iodine mono-chloride and the iodine oxidised with chlorite in 4M acid. The electron-beam sectrometer or the indicators, amaranth, bordeaux, naphthol blue-black or brilliant ponceaux, may be used to detect the endpoint of the reaction. Titrations of the cuprous thiocyanate precipitates from the determination of copper agree with determinations made by the Jamieson method.

The determination of iron was studied and shows promise. Titrations or portions of a standard ferrous sulphate solution using the electron-beam sectrometer showed that the reaction was quantitative in 6M hydrogen acid. Iron may also be preoxidised by iodine monochloride and titrated in the usual manner.

Sodium chlorite has been shown to be as applicable as potassium iodate or potassium bromate when used as a volumetric oxidising agent. The determinations of iodides, iodine, arsenic, antimony, thiocyanate, copper and iron have been studied. Special comment should be made about the fact that this method for the determination of thiocyanate agrees with the Jamieson iodate method, while other methods employing such oxidising agents as permanganate, ceric ion and others show discrepant results. It is predicted that sodium chlorite may be used in the determination of tin, ferrocyanide, thallium, hydrazine and its derivatives, formaldehyde, etc.

Electrometric Determination of Phenols

In connection with the direct electrometric determination of phenols and aromatic amines, solutions of phenol, m-cresol, aniline, *m*-toluidine, *p*-chloroaniline and anthanilic acid were prepared and standardised by the method of Day and Taggart (*Ind. Eng. Chem.*, 1928, *20*, 545). Measured portions of these solutions were acidified so that the solution was 5 per cent. by volume of concentrated hydrochloric acid, one gram of potassium bromide was added, and in the case of phenols, 10 mg. of cupric or ferric ions was added as catalyst. The solutions were heated to 50° C. and the titration made. The sector of the 6E5 tube in the instrument closes for a short time after about 75 per cent. of the bromate has been added. This is because the bromination of the organic molecule is slow, and a slight excess of bromine has formed in the solution. From this point the bromate must be added slowly, allowing the reaction to become complete before the next addition is made. The sector closes after each addition and opens when the reaction is complete. At the endpoint the bromate is added dropwise, and when the sector remains closed for more than one minute after the addition of a drop, the titration is complete.

This method has been shown to be generally applicable to easily brominated phenols and aromatic amines with an accuracy consistent with the requirements of a good analytical method.

The determination of iron using bromate has been described by Smith and Bliss (*J. Am. Chem. Soc.*, 1931, *53*, 4,291). They used basic mercuric bromate as the oxidising agent, a special titrating solution containing cupric ion as a catalyst and bordeaux as the internal coloured indicator.

The potentiometric titration of iron with sodium bromate is slow, and iodine monochloride and mercuric chloride were studied as catalysts. It was found that the presence of 10 ml. of 0.005M ICl increased the speed of the reaction fivefold, and in combination with 2 g. of mercuric chloride the rate was increased another fivefold in 3M hydrochloric acid. The method may be employed using the titrimeter of Willard and Hager, or the electron-beam sectrometer with the self-polarising tungsten-platinum electrode system. In the case that a solution of a ferric salt is to be analysed, either the Jones reductor or Walden reductor, or the well known method employing stannous chloride and mercuric chloride may be used to prepare the solution for titration.

ENZYME PREPARATION IN TEXTILE PROCESSING

By
G. S. RANSHAW

A NUMBER of enzyme preparations are available for industrial uses, the amylases being the most important in textile finishing. They are principally used where it is necessary either to degrade starch completely or to hydrolise it only partially.

Two different types of enzyme are currently employed. These are the so-called beta-enzymes, represented by malt amylase, and the alpha-enzymes, represented by pancreatic and bacterial amylases. The end product of both types after reaction with starch is maltose, but on those preparations consisting of a mixture of alpha and beta types the end product is not maltose but glucose.

Several factors govern the choice of the type of enzyme to be used in the textile operation. These include conditions of temperature and *p*H, the intensity of actions of the preparation, and its effect on the textile fibre. Most important, perhaps, is the particular type of routine existing in the works, as in some cases it is possible to leave the goods piled wet overnight, whereas in other cases a system of continuous working is essential. Although malt diatase is less powerful than the other two mentioned, it may be preferred from the point of view of its effect on the fibre, since it leaves it less harsh, imparts a certain elasticity, and, thanks to the hygroscopicity of the maltose, saves it from becoming brittle. As a matter of fact, certain non-enzymic maltose preparations have been used in rayon finishing on account of this specific property.

The malt and pancreatic diastases are somewhat cheaper than the bacterial type and thus will be used where works routine permits, while the particular type of action associated with the bacterial diastases makes them invaluable where a continuous process is necessary.

Making a Starch Preparation

In making a starch preparation for sizing purposes the amylases are employed because of their capacity to hydrolise the starch. The conversion, obviously, must not proceed to the point where maltrose results, but should stop at the intermediate one where the product is soluble starch. As is well known, this product is generally made by boiling starch with dilute mineral acid. For a " short " conversion of this type the bacterial diastase is probably best, owing to the fact that it can withstand higher temperatures, the best range for the production of soluble starch being from 60° to 70° C.

On the other hand, in desizing, complete degradation of the starch is necessary. Formerly, this was only possible by the action of acids or alkalies, which can easily have a detrimental effect on textile fibres, but the marketing of animal and bacterial diastases has now enabled starch to be cleared rapidly, effectively and with complete lack of any harmful effect to cotton, wool or rayon. The optimum temperature for desizing with these enzymes is about 50° C.

Apart from this, essential differences in the various amylases are revealed when the optimum *p*H conditions for their action are considered. Malt amylase exercises its highest effect at a *p*H of from 4.6 to 5.2, that is, in relatively acid baths, whereas the highest efficiency of the pancreatic and bacterial types is shown at *p*H 7, or under approximately neutral conditions.

Besides the uses of the amylases in desizing and in the production of starch sizing mixtures, there are other important outlets for these products. As is known, the colour used in calico printing is applied in the form of a paste in which the pigment is mixed with various ingredients to give it consistency and prevent it from running. For this purpose, starch which has been hydrolised by an amylase to the dextrin stage can be used in many cases. In laundry practice, also, amylases can be used to strip the surface starch from articles, thereby also loosening the dirt particles embedded in the starch so that they can be more easily peptised by the soap liquor. In garment dyeing and cleaning, too, starch may have to be stripped from articles to be re-dyed. Preparations containing lipases and proteases may be used in conjunction with amylases where there is also the need for splitting fats and protein substances.

Degumming Raw Silk

The normal way to separate the serecin or gum from the fibroin of a raw silk filament is to treat it in a hot solution containing a soft soap from olive or ground-nut oil, or one of the cheaper soaps of a hard nature from the same oils. It is necessary for the success of the operation that the soap shall be as far as possible free from alkali—a requirement adequately fulfilled by the types mentioned.

A problem arises, however, when, as is most common today owing to the trend of modern fashion, another textile material, such as acetate or wool, is found in conjunction with the silk. The silk, being woven in the raw state, requires a subsequent degumming process, but if the normal degumming process were resorted to, the other fibre would suffer. For example, if a hot soap solution were applied to a silk-acetate mixture, the acetate would suffer. It would be liable to tendering, and, owing to the saponification of the surface of the fibre, its dyeing properties would also be affected. If the mixture were a wool-silk one, the normal degumming process would only result in felting of the wool, and the open, lofty character of a wool-silk mixture would be entirely missing.

In the case of fabrics composed wholly of silk, it is unlikely that soap will be displaced in favour of any of the newer agents, thanks to its relative cheapness and to the fact that it gives a valuable by-product in the form of bast-soap. With the mixtures mentioned, however, an alternative method is advisable, and the possibility of using an enzyme is worth consideration. Serecin, being a protein substance, will of course require an enzyme of the protease or protein-splitting type.

The proteases available are of two varieties. There is first the protease of pancreatic origin and, secondly, the vegetable enzyme papain obtained from the juice of the melon. In estimating their suitability for the task of degumming silk in mixture fabrics we have, necessarily, to consider the conditions under which they exert their best effect.

Pancreatic Enzyme Recommended

Enzyme preparations of pancreatic origin have long been recommended for the degumming of silk mixtures, and a typical procedure is as follows. The cloth is first passed through hot water at 70° to 80° C. until wetted out, in order to swell the silk gum. The enzyme bath is prepared at 55° C. and the degumming treatment is carried out on a jig or winch machine for three hours. The solubilised gum is removed by washing well for 10 to 20 minutes in hot water at least 80° C. Finally, to remove all traces of the gum, fabric may be lightly soaped for about half an hour at about 70° C. in a soap solution. Where the preliminary wetting out can be done at the boil, *i.e.*, where acetate is not present, this last treatment is not necessary.

The chief objection to this process is that, in order to exert its maximum effect, the pancreatic enzyme must be applied in an alkaline liquor, and that at temperatures over 50° C.

its activity is curtailed. The need for an alkaline liquor means that one has not entirely done away with the danger of saponifying acetate or felting wool by using an enzyme, while the low temperature at which the process is carried out results in undesirable prolongation of the operation.

Papain, however, seems eminently fitted for the removal of serecin in silk mixture fabrics. In the first place, it works best in a neutral or slightly acid medium and thus has no effect on alkali-sensitive materials. Moreover, it is remarkably resistant to high temperatures, the normal working range being from 60° to 70° C. A short treatment with a preparation of this enzyme, followed by a light soaping, results in the complete removal of the gum, the fabric suffering neither in appearance or quality.

It is not possible, however, to use simply the ordinary commercial papain in aqueous solution, since in this form its attack on protein material goes on very slowly. The fact that certain materials function as "activators" has been known for some time, but in most cases the earlier ones were either of a poisonous nature, such as HCN, and thus unsuitable for ordinary works use, or else they were too expensive, and sometimes even commercially unobtainable. Nevertheless, after prolonged investigation of the subject it has been proved that two relatively cheap and common substances—sodium thiosulphate and sodium hydrosulphite—can be successfully used as activators for the papain enzyme in textile work. For silk degumming, a mixture of the two activators mentioned is best recommended, but where the hydrosulphite would have a deleterious effect, for example, where vat colours are present in the fabric, the sodium thiosulphate can be used alone in a medium which has been made weakly acid by the addition of a little acetic.

Efficiency of Papain

Some figures emanating from recent work done under the auspices of the I.G. Farbenindustrie in Germany illustrate the efficiency of the method.

A "crepe de chine" composed of high twist yarn is completely degummed when treated for two hours at 65° C. with a liquor consisting of 20 per cent. papain, 40 per cent. sodium thiosulphate and 40 per cent. hydrosulphite in a 3 gr. per litre concentration.

The following recipe is recommended if it is desirable to avoid the use of hydrosulphite. The liquor consists of 40 per cent. papain, 40 per cent. sodium thiosulphate and 20 per cent. sodium phosphate, to which is added about 8 cc. acetic acid per litre of liquor. The goods are treated in a bath of this composition for about one hour at 65° C., after which they are transferred to a bath where they are lightly soaped for half an hour at 65° C., the bath being made up of 5 g. Marseilles soap per litre of liquor. After rinsing and drying the goods will be found to have been completely degummed.

By following the papain method, the avoidance of alkaline conditions fully preserves the appearance and handle of the goods. Even where acetate is present the final soaping at 65° C. (which is necessary completely to remove or disperse the products brought about by the decomposition of the serecin) should be harmless. Where doubt exists, the temperature may be reduced by 60°. It has proved inadvisable to attempt to degum by the use of the enzyme in a bath containing one of the modern washing and dispersing agents as some of these are precipitated at once, some hinder the action of the enzyme, and none gives as satisfactory results as ordinary Marseilles soap.

One of the advantages of working with amylases where cellulosic fibres are concerned has been mentioned. This is the fact that such fibres are unattacked by them, no cellulose being present in textile enzyme preparations. Pectinase has, however, been detected, and has the property of degrading or liquefying the pectin products always present in raw cotton. Their incorporation in bowking and bleaching liquors, under suitable conditions, therefore, might be expected to bring about a welcome curtailment of these processes and a considerable improvement in the fibre.

Nickel Catalysts

"Ageing" in Hydrogenation Processes

ACCORDING to the technical section of *Deutsche Bergwerks Zeit.* (July 12, 1939), a particularly active catalyst for hydrogenation is obtained by the reduction of nickel oxide by a stream of hydrogen at a temperature of about 250° C. The reduced nickel is in the form of regular crystals and is ferromagnetic. Some months ago G. le Clerc and Michel observed that the regular crystallised nickel goes over to a hexagonal crystal form if, for some days, it is maintained at a temperature of 170° C. in a carbon monoxide atmosphere. G. le Clerc and H. Lefebre (*Compt. Rend.*, 1939, *208*, 1,650) have recently established the fact that nickel, after going over into the hexagonal crystal form, loses its catalytic properties.

This knowledge is of importance in the Fischer-Tropsch process of hydrocarbon synthesis. With the regular crystallised nickel obtained by the hydrogen reduction of nickel oxide at 175° C., when a mixture of carbon monoxide and hydrogen is conducted over it at atmospheric pressure, there is a large condensation of the gas into water and hydrocarbons. After a time, which varies according to the operating conditions, the conversion of the gas mixture to water and hydrocarbons gradually becomes smaller and finally ceases altogether. Rontgen ray spectroscopic investigations have shown that the nickel, in the course of the catalytic process without apparent change in the crystal sizes, has gone over to the hexagonal crystal form, and no longer shows ferromagnetic properties.

When heated for several hours in a vacuum, or a nitrogen atmosphere, at a temperature of 250° C., the nickel regains its original catalytic activity, as well as the regular crystal form and ferromagnetic condition, and this cycle can be repeated many times. When a mixture of hydrogen and benzol vapour is passed over regular crystallised nickel obtained by the reduction of the oxide, there is obtained without difficulty cyclohexane, or isopropyl alcohol. If, however, this is attempted with nickel in the hexagonal crystal form obtained in the carbon monoxide and hydrogen synthesis, after careful purification by washing with ether and de-gassing at 170° in vacuum, there is no reaction. With a mixture of acetylene and hydrogen at ordinary temperature conducted over regular crystallised nickel there is a strong contraction of the gas volume with the liberation of considerable heat, while with nickel in the hexagonal crystal form, no kind of change can be observed. On the other hand, reduced cobalt in the Fischer-Tropsch process has the same catalytic action both in the regular and the hexagonal crystal forms.

The above results show that the catalytic and ferromagnetic properties of the nickel are in close connection with the atomic structure and throw valuable light on the "ageing" of the nickel catalyst in the hydrocarbon synthesis.

DECREASE IN WORLD DYE PRODUCTION

According to the commerce reports of the Bureau of Foreign and Domestic Commerce, United States Department of Commerce, the production of dyestuffs throughout the world decreased approximately 25 per cent. in 1938 compared with 1937.

This reduction in output was due in part, it is stated, to the relatively large carry-over of stocks from 1937 in some countries, but mainly to decreased consumption both in producing countries and in export markets. It is estimated that exports of dyestuffs from Germany were 27,505 metric tons compared with 38,465 metric tons during the preceding year. British dyestuffs output decreased 28 per cent. and exports were also lower. In the United States dye production decreased approximately 33½ per cent. to 81,326,000 pounds compared with the recent output of 122,000,000 pounds during 1937. Exports were recorded at 8,575,000 pounds against 16,700,000 pounds in 1937.

Annual Meeting of Benn Brothers, Limited

Sir Ernest Benn on " A Business with Character and Reputation "

THE forty-third annual general meeting of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, was held at Bouverie House, Fleet Street, London, E.C.4, on Friday, August 4. Sir Ernest J. P. Benn, the chairman of the company, presided.

Sir Ernest Benn, in moving the adoption of the annual report and accounts, said:—" This perfectly wonderful trade and technical paper business is something apart, something by itself, something really worth while. It is a business with character and reputation. It is devoted to service, it possesses a soul. It is a manly, serious business that makes me wonder sometimes about tendencies which I notice.

" The tendency here and there to introduce a funny column and to appear frivolous has nothing to do with a trade and technical paper. I sometimes think I should be as likely to find a pin-table in the Mansion House or a darts-board in a doctor's surgery as a funny column in one of our trade papers. They do not fit in and give people a totally wrong impression.

" Some years ago I was proud to say a good deal about putting the trade paper in the centre of Fleet Street. I am still proud of that, but do remember that we put the trade paper in the centre of Fleet Street for Fleet Street's good, not to bring the trade paper down to the level of the popular Press, about which I hold my own views.

" In this periodical business you have to distinguish very definitely between a ' publishing proposition' and an ' advertising dodge.' That is a slogan which I got from America some thirty or forty years ago. You can take up any of these periodicals, not ours, and it is easy to classify them into two types.

" It is perfectly true that we live on advertising revenues, that we must sell advertising space. It is equally true that as a nation we live by export, that as men and women we work for money. All these things are superficially true, or part of the truth, or as much of the truth as can be digested by the average member of the public to-day.

" It is in a way untrue that a man only works for money—he works for what money will buy. Neither does a nation live solely by export. It exports in order that it may import. Likewise it is only partly true to say we live on advertising revenues. We live on the fact that every Tuesday, or Thursday, or Friday, as the case may be, thousands of readers rush to see what our journals say about this question or about that problem which is uppermost in their minds. That is the basis of our business, that is a ' publishing proposition ' as distinct from an ' advertising dodge.'

The Theory of Competition

" In dwelling upon our problems I am often confronted with the question of competition. I am told that this paper does so and so and therefore we must do it as well. What a stupid, degrading idea that is! To begin with, we all know that imitation is the sincerest form of flattery, but it is the misconception of the theory of competition which is so serious. The way to compete is not to be alike, but to be different. Don't reduce yourselves to the imitator whom you flatter by calling a competitor. If another paper is spoiling itself at the behest of an advertiser, be grateful for its folly.

" We have to develop, as straight trade paper people, a superiority complex. We know the material on which it is our duty to work, and it is absurd for a man outside the publishing business to pretend that he can dictate to us on the production of a responsible trade organ. The attitude of mind that should be inculcated in the advertising staffs can best be expressed by two simple thoughts. First, we publish the Bible of the trade, and I use the word advisedly, and secondly we accept advertisements—with a capital A to accept.

" A word about all this ' jitters ' talk, which is, believe me, worse here than in any other country in the world. It is up to us trade and technical paper proprietors—the guardians of the economic life of the country—to put a little ' guts ' into things. The situation is as simple as it is possible to be. All history shows that a strong Britain means a peaceful world. Thanks to various sorts of politicians, who shall be nameless, we have ignored it too long and so we have now to make this enormous effort, but in the confidence that it is a guarantee of peace." In conclusion the chairman paid a tribute to the staff, " the finest body of men and women," he said, " brought together in any business enterprise."

Mr. Gordon Robbins, deputy chairman, in seconding the resolution, said that he had rejoiced in hearing again the " Gospel according to Sir Ernest." It was a fine thing to have from time to time his straight from the shoulder reflections, not only on the trade paper business, of which they were all extremely proud, but on current affairs. During the year under review the company had experienced the crises of September, 1938, and of March, 1939, and these happened to coincide with two of its most remunerative months in the ordinary way.

" Weathered the Storm "

" It is apparent from the accounts," he continued, " that we weathered these storms on the whole successfully, and having weathered them we are looking forward during the next twelve months to entering into smoother water. With the loyal and enthusiastic help of the staff, I feel sure we shall be able to show even better figures next year.

" The coming financial year will reach into the calendar year of 1940, which will be an important one for the company and for the staff. In 1940 Sir Ernest Benn will have been associated with this business for fifty years, during which it has grown from a small enterprise with one paper to the huge concern that it is to-day. The year 1940 will mark also the diamond jubilee of the firm and of its first paper, *The Cabinet Maker*. These are two high-lights for 1940 and should put us all in the right frame of mind to go forward with even greater energy and strength than in the past."

The chairman then put the resolution to the meeting and it was carried unanimously.

Mr. H. B. Crole-Rees moved, and Mr. R. Webb seconded, a motion which was carried unanimously, that Sir Ernest Benn and Mr. K. E. Hughes be re-elected directors of the company. Sir Ernest said that he was very pleased that after ten or eleven years of fine work in the service of the firm Mr. K. E. Hughes had earned a seat on the board.

Mr. Norman French moved and Mr. K. E. Hughes seconded the re-election of the auditors, Cassleton, Elliott and Co., and the motion was carried unanimously. Mr. B. A. Glanvill proposed a vote of thanks to the chairman. This was seconded by Mr. D. G. Street and carried with acclamation.

THE French Ministry of Public Works announces that the State reserves to itself all the rights of prospecting and exploiting any oil and gas-bearing land which may lie in the region bounded by Mirande (Gers), Lannemezan (Hautes Pyrénées), Montesquieu-Avantès (Ariège), and Le Fossat (Ariège). A rich pocket of natural gas, giving hope of petrol deposits, was recently struck near St. Gaudens, and it is now evident that the discovery is being taken seriously by the authorities.

Phosphate Fertiliser*

German Utilisation of Iron Works Soda Slag

THE de-sulphurising of pig iron with soda according to the process devised by Paschke and Peetz, is finding extensive employment in Germany, resulting in the production of large quantities of strongly alkaline slag. The purpose of the process is to remove the sulphur from molten pig iron produced by the so-called "acid smelting" outside the blast furnace, instead of within the blast furnace when a basic charge is smelted. The composition of the soda slag varies within the following limits, according to the iron ore composition, and also to whether the soda is used alone or in combination with other basic material :—

Silica	22 -34	Magnesia	1 - 5
Iron	3 -10	Phosphoric acid ...	0.5
Manganese	2 - 8	Vanadium ...	0.1- 0.6
Alumina	0.5- 3	Sulphur	2 -15
Lime	2 -10	Soda (Na_2O) ...	23 -35

The sulphur is in the oxidised form principally, but a part is in the form of sulphide.

The question of utilising this soda slag has been the subject of considerable investigation, and the most promising outlet appears to be its use in decomposing and making soluble raw natural phosphates to produce a phosphate fertiliser. Already a process is being operated in Germany jointly by three concerns: the Guano-Werke A.G., of Hamburg, the Oramburger Chemischen Fabriken A.G., Berlin, and the Rochling Eisen u. Stahlwerke G.m.b.H. at Volklingen.

Somewhat similar attempts at producing phosphate fertiliser in a silicate melt were made during the War when, of course, soda slags were not being produced in the iron industry, and since then other processes otherwise more or less successful have failed due to the destructive action of the molten phosphate on the furnace material, as well as the imperfect removal of the sulphide sulphur. With regard to the first named difficulty, high grade fire-clay bricks were destroyed in 24 hours, best magnesite bricks in eight hours, while bricks made of natural quartzite had a life of only ten days before being completely dissolved in the phosphate melt. A better material for the purpose of furnace lining was found in Portland cement and cement clinker.

The soda slag and raw phosphate are mixed in proportions so that the ratio of phosphoric acid to alkali is approximately 1 :1.3, which is found to produce the best desired end-product. Additions of silica, iron, or alumina to the mixture were harmful, while the addition of chalk was without influence on the solubility, and was merely unnecessary ballast. The Volklingen soda slag contains only from 2 to 6 per cent lime.

The addition of soda improved the decomposition of the raw phosphate but was too expensive, but the addition of about two per cent. sodium chloride was found to very appreciably increase the solubility. Special cylindrical furnaces are used in the production of the fertiliser and from these the molten mixture is discharged into water and granulated, which is said to increase the solubility over that of a melt allowed to cool slowly.

The composition of the end-product, which is known as "Rochling Phosphate," is given as follows :—

Silica	19.7	Soda (Na_2O)	12.3
Iron	3.5	Magnesia	3.4
Manganese	1.7	Total sulphur	0.5
Alumina	4.1	Sulphide S	0.2
Lime	33.2	and very small quantities of other constituents.	

The total phosphoric acid in the end product is given as 21.30 per cent. of which 21.20 per cent. or 99.6 per cent. of the acid, is soluble in citric acid, and 20.18 per cent. or 94.7 of the acid, is soluble in ammonium citrate. This represents a valuable and quick-acting phosphate fertiliser.

* An abstract from an article by K. H. Hennenberger in *Stahl u Eisen*, June 1, 1939.

Hardening of Fats through Isomerising

Dutch Company's Development

THE process of fat hardening in which liquid fats and oils are converted into solid or semi-solid condition by a process due mainly to the research of a German chemist named Norman, rests on the saturation of unsaturated compounds in the fatty molecule by the taking up of hydrogen by the aid of a catalyst, such as nickel. In this way the carrying-over of the whale oil in margarine was first made possible.

Recently the Bataafische Petroleum Mij. of the Hague, Holland, has (according to the technical section of *Deutsche Bergwerks Zeit.*, July 11, 1939), developed a process (British Patent 502,390) for fat hardening by isomerisation, that is, the isomerisation of the fat molecules without change of the molecular weight. This is effected by treating the oil or fat with liquefied sulphur dioxide at a moderate temperature, and at such a pressure that the sulphur dioxide remains liquid. In this way a good edible fat without odour and free from any kind of biologically active substance is obtained. Such portions of the fat or oil under treatment not isomerised can be separated from the isomerised portion by selectively acting solvents, of which sulphur dioxide is an example, and these can be given a further isomerising treatment.

For example, palm oil can be freed of oxygen by passing nitrogen gas through it, and then to 55 parts of the oil adding 35 parts of sulphur dioxide, and heating this mixture in an autoclave at a temperature of 110-115° C., and under a pressure of 40 atmospheres, for two hours. After separation from the sulphur dioxide a product is obtained with the same iodine number, and an unchanged quantity of 0.03 per cent. sulphur, but the melting point has increased from 36° to 41°. By similar treatment olive oil and cotton seed oil have their melting points raised from 6 to 25°, and from 9 to 26° respectively.

S-Diphenylguanidine

Standard for Acidimetry

A NEW standard for acidimetry, *s*-diphenylguanidine, is claimed by Young (*Canadian Jour. Research*, 1939, *17*, 6, 192-197).

Of the known standards for the determination of the titre of acids, only sodium bicarbonate can be regarded as really satisfactory. Sodium carbonate is hygroscopic, and so is borax. Diphenylguanidine, on the other hand, is quite stable and does not absorb more than 0.02 per cent. of moisture under ordinary atmospheric conditions over a period of months.

The compound was purified by repeated crystallisations from toluene, preceded in some cases by solution in methanol followed by precipitation with water. Three recrystallisations from toluene appeared to be enough to give a product of defined melting point—148.9° C.; further crystallisations only raised this by 0.1° C. The density of the purified compound was 1.19.

When used for standardising hydrochloric acid solutions, the base gave results to within 0.05 per cent. of those given by sodium carbonate and borax. The solvent for the base may be either methyl, ethyl, or iso-propyl alcohols, and the indicator methyl red or brom-cresol green. The commercially obtainable purified base gave results to within 0.01 per cent. of those given by the recrystallised material.

Recovery of the diphenylguanidine from the solutions of its hydrochloride may be effected by precipitating it with excess of caustic soda, followed by dissolving it in methanol, reprecipitating with water, and then recrystallising (after drying) in toluene.

ROAD TAR RESEARCH

Influence of Modern Trend on Road Practice

AT the International Road Tar Conference held recently in Brussels, Mr. D. W. Parkes, M.C., B.A., B.Sc., F.I.C., who is research chemist to the Midland Tar Distillers, Ltd., Oldbury, Birmingham, read a paper dealing with the trend of modern road tar research and its anticipated influence on road practice. The following are extracts from the paper:—

It has been realised for some time that there is available a wealth of information on the behaviour of tar in the laboratory under artificial conditions as well as numerous tests both simple and complicated which have been applied to tar, with the object of standardising its properties, but when a search is made for information as to the meaning of the results of all this work in terms of road performance, little is to be found in the way of sound evidence which would stand the test of critical scientific examination.

Most standard specifications for road tars lay down limits of specific gravity, naphthalene content, and matter insoluble in benzene or other solvent, but the connection between these properties and performance under any given conditions has never been explained, because no serious attempt has ever been made to correlate these properties with performance. Specific gravity was probably introduced to exclude to some extent the more recent types of low aromatic tars, but when one remembers that bitumen itself is of lower specific gravity than most tars and consists mainly of non-aromatic bodies the requirement of a specific gravity limit without a proved practical basis is clearly unsound.

Limitation of naphthalene is in much the same case, though here it would seem to be an attempt to exclude excessively high aromatic tars, but with the same absence of justification.

The position is even more absurd with the third property which I have chosen, namely, matter insoluble in benzene or other solvent. Assuming for a moment that this insoluble matter is deleterious when present in quantities outside the limits laid down, there is no evidence to show that the insoluble matter derived from a high aromatic tar is of the same composition or properties as that derived from a low aromatic tar; in fact, there is considerable evidence to show that the quality of the insoluble matter differs markedly according to the type of tar from which it is derived. In this connection it may be of interest to note that in the laboratories of my own company a binder has been prepared containing no matter at all insoluble in benzene, which when tested on the road by means of our accelerated thin carpet test proved to be many times more durable than an ordinary tar prepared from the same crude tar.

I have referred so far to some of the properties and tests for tar which are almost universal, but many attempts are being made to develop what are called durability tests for tars, and the results of these tests so far have been contradictory. One reason for these contradictions is that the tests have often been developed from theoretical considerations, and the results obtained have not been compared with results obtained with the same tars on the road.

Controversial Points

One of the main points of controversy is whether the changes which take place in tar are mainly due to loss by evaporation or to the numerous other factors, such as the influence of light, polymerisation, oxidation, etc. In most of these tests a film of tar is subjected to one or other form of exposure and the changes in the properties of the film are observed. In some cases an exceedingly thin film is employed, much thinner than any film which would be used on the road, in others the film is excessively thick.

Now it seems clear that the relative magnitude of the effect of, for example, evaporation, ultra-violet light and oxidation must depend very largely on the thickness of the film used for test. If the film is very thin, any change which takes place in the surface only, due, for example, to oxidation or ultra-violet light, would have a relatively enormous effect on the physical properties of the film as a whole, while if the film were thick the changes due to these factors would affect so small a proportion of the film as a whole that they might escape notice. The thickness of a film of tar used in any durability test must be of the same order as the thickness of the film of binder on the road. Further, although it may seem obvious, it is well to remember that a single durability test such as I have referred to, even if it can be so devised as to correlate reasonably well with road performance in one type of road construction, will not necessarily be applicable to other types of road construction. For it was very clearly pointed out by Prof. Hoepfner that when a road surface is completely sealed little or no hardening of the binder takes place, and that in the surface itself of, say, a close graded carpet, the hardening of the tar only extends to a very small depth and is beneficial, giving a result similar to case hardening in the steel industry.

Meeting Criticisms

An attempt has been made to meet the above criticisms in England by means of a very comprehensive programme of work which has been put into operation with the main object of correlating the properties of tar as demonstrated by laboratory tests, with actual performance on the road.

Prior to 1936, a number of full scale trials were carried out, but they had no direct connection with laboratory work. By 1936, however, laboratory work had reached such a stage that it was felt desirable to test out some of the conclusions on the road. Two subjects had been largely engaging the attention of research workers—namely, the behaviour of different types of tar on exposure, and the problem of the adhesion of tar to wet gravel, more especially a somewhat porous gravel found in the South of England. Both these subjects were being studied from the point of view of surface-dressing. It has been found that low and high aromatic tars behave differently when exposed at temperatures below 32° C.; the former dries slowly but constantly over a long period; the latter dries rapidly in the early stages whereupon a skin is formed and the rate of drying slows down to a very low figure.

It was argued that this behaviour of low aromatic tar was disadvantageous and would lead to picking-up and bleeding during its early life in a surface-dressing; a technique for measuring the speed of setting of the tar was developed; certain waxy bodies were isolated from low aromatic tars, and it was proved that they prevented skin formation. Finally, it was shown that the addition of a calcium soap to low aromatic tars induced skin formation. On the other hand, the practical experience of tar distillers handling large quantities of low aromatic tar pointed rather to the opposite view—namely, that if anything these tars tended to dry rather too quickly. It was felt that the point should be decided by full scale surface-dressing tests.

The second subject which had been engaging the attention of research workers—namely, the adhesion of binder to wet gravel—was one of some practical importance since there were large quantities of the particular gravel available, and it is obviously desirable to use local material for road purposes wherever possible. Again research workers had shown in the laboratory that if the gravel was treated with a small quantity of tar oil (preferably a low aromatic creosote) and then allowed to dry or "weather" for a week or two, tar would adhere to the stones even in the presence of water. It seemed possible that the use of such "oiled" gravel might prevent displacement of binder from the stone during the early life of the surface-dressing under wet conditions. It was decided

that this, too, should form the subject of a full scale experiment.

The calcium soap experiment consisted of three sections of 80 yd. each, on which were used a low aromatic tar with and without 1½ per cent. of calcium soap, and a high aromatic tar. The boiling ranges of the oils to 300° C. in these three tars were very similar, but the residue at 300° C. from the soaped tar melted some 3°-4° higher than those of the other two tars. During laying, the shade temperature was 16°-22° C. and the road temperature 16.5° to 27° C. both of which are well under the critical temperature of 32° C. below which the drying properties of high and low aromatic tars had been found to differ so markedly in the laboratory.

Lack of Correlation

An inspection some ten days later showed no significant difference between the three sections. One can conclude, therefore, that although the laboratory tests showed differences in drying properties, these differences had no significance in connection with the setting of the tars under the practical conditions of the experiments. One could offer many explanations of this lack of correlation, but the most probable one lies in the fact that in the laboratory the rate of drying has been measured on films of the original tars; in practice, before these tars are used they are submitted to comparatively high temperatures in the form of thin films prior to and during spraying. The degree of drying during this procedure would probably be far greater than the degree of drying during the laboratory test at 30° C., so that the final viscosity of the residues in all cases would be sufficiently high to retain the chips satisfactorily on the road.

Referring to some work carried out in the laboratories of the Midland Tar Distillers which are of interest in connection with the correlation of laboratory results and road performance, the paper continued:—

I was called upon in the course of my work to investigate the possibility of improving the durability of road tar more especially for use in thin carpets of open texture where the tar film is subjected to maximum exposure to atmospheric conditions. There was no lack of ideas as to the means of modifying the properties of tars, but there was a complete absence of any quick and decisive method of gauging the effect of such changes in composition and durability.

Much work was carried out with a view to altering the susceptibility of tar to changes of temperature, until it was realised that, as far as durability is concerned, the susceptibility of the tar as applied is of little significance compared with the susceptibility of the tar after it has been in use for a year or two. Thereafter attention was directed to the behaviour of various types of binders after artificial weathering, and it was found that while material A might have a higher susceptibility to change of temperature than material B before weathering, the order might be reversed after weathering.

Susceptibility to Temperature Change

Susceptibility to change of temperature is only one of many factors affecting behaviour in use, and it was desirable to find, if possible, a single test, the results of which would embrace all those properties of a road binder which contribute to its durability.

Retention of ductility within the range of normal temperatures over a long period is probably the most important characteristic of a good road binder, and this property is the fundamental basis of our Rubber Strip Test. The test originated in a very crude form and consisted of spreading films of binder on rubber strips, weathering and stretching the rubber by hand; the cracking of the film, in conjunction with the time of weathering and the temperature of the film when stretched, was used as a sorting test in the laboratory. The test, even in this crude form, served to distinguish sharply between a number of types of binder.

These preliminary laboratory tests in conjunction with the accelerated thin carpet tests gave indications that those coal tar binders which are very satisfactory for surface-dressing and other purposes are not necessarily suitable for the construction of thin carpets of open grading; they also indicated a modification of the binder which would give excellent results in such thin carpets. Long before the conclusion of the accelerated carpet tests, the results were considered sufficiently promising by the sales side to warrant full scale road trials, and these have since been carried out on a somewhat extensive scale. The results so far justify our conclusion that the rubber strip test is a useful laboratory tool for estimating the durability of a binder in use. It was therefore decided to develop and standardise the test for use both in fundamental work on the durability of road binders and as a control test on the works.

The development of the apparatus and the standardisation of the conditions of the test have now been completed, and a start has been made with the examination of some of the fundamental factors affecting the durability of coal tar binders. Briefly, a film of tar 0.005 in. thick is automatically spread on a rubber strip, and submitted to any form of weathering desired; we have used periods of heating at 40° C. up to 72 hours. The weathered film is then inserted in an elongating cabinet which can be cooled to −25° C. or heated to 50° C. in a few minutes, and the film is automatically elongated 35 per cent. The highest temperature at which the film cracks is determined and called the Critical Temperature (C.T.). The critical temperatures are then plotted against the periods of weathering giving characteristic curves.

Significance of Curves

The full significance of these curves is at present still under investigation, but for a binder which is submitted to maximum exposure in use, we have shown that the critical temperature at 72 hours weathering is significant, and that a binder which has a critical temperature above 40° C. is not very suitable for use in very open thin carpets. On the other hand, we have proved that for a close graded thin carpet a binder with a critical temperature as high as 50° C. is excellent.

Reference has already been made to the effect in practice of the comparatively short but high temperature heating period which occurs during mixing or spraying. This pre-heating has been stimulated in our test by placing the strip in an oven at 70° C. for 30 minutes prior to the ordinary weathering at 40° C. The effect of this pre-heating is interesting; the critical temperatures during the early part of the weathering are raised in all cases as might be expected. In the case of some binders, however, the two curves become identical again at about 72 hours' weathering, while in other cases the pre-heated films still have higher critical temperatures at 72 hours than the untreated films. The test has also shown that if from a given tar base or soft pitch and oil, several fluxed tars are made of different viscosities, these tars have identical critical temperature curves. It is only when the quality of the oil is altered that the form of the curves is altered.

Supposing out of all this endeavour to correlate the results of laboratory tests with road performance, positive results emerge, what will be the effect on road practice? The most important, though probably not the first, result will be a complete change in the type of standard specification. I hope that every item in future specifications will have a practical meaning. At present tars have to comply with certain arbitrary requirements of specific gravity, distillation range, insoluble matter, etc.; the only property which is deliberately varied to suit conditions of use is viscosity. At present variation in viscosity is supposed to be sufficient to render any tar suitable for any purpose to which it may be put. In the future viscosity will be a small and unimportant item connected only with the handling of the tar before it is used; the important items in future specifications should deal with setting time, quantitative loss on exposure, ductility of residue on exposure in relation to temperature, healing properties of the binder after exposure.

New Technical Books

PRACTICAL CHEMISTRY. By J. Bruce and H. Harper. 4th edition. London: Macmillan and Co., Ltd. Pp. 509. 6s.

This volume contains a selection of typical preparations which can easily be carried out by a careful student. The methods described have all been repeatedly practised in the authors' laboratories, and found to yield satisfactory results. A number of simple organic preparations has also been added. The arrangement of the inorganic preparations is not necessarily that in which they should be taken, but it would be well for a student beginning the study of organic chemistry to work through the organic part in the order given. Some knowledge of elementary chemistry is expected to be possessed by students using this book although an introductory section has been included, containing a short account of the apparatus and appliances required for the work which follows.

The section on qualitative analysis has been made sufficiently complete for practical purposes, but some knowledge of organic chemistry will be required for a proper understanding of the reactions and detection of the organic acids. Quantitative work is dealt with in a simple manner in Part II of the book, and here also a short account of the principles underlying quantitative analysis, and of the apparatus employed in carrying out the work, has been included in the introduction. The sections on volumetric and gravimetric analysis are intended to serve only as a short introduction to these branches of quantitative work.

In the present edition portions of explanatory text such as the article on ionisation, colloids, etc., which appeared in the earlier edition, have been extended and grouped together so as to form a brief and consecutive account of the theoretical foundations of practical chemistry. Many other additions and extensions have been made, in particular that on the reactions of the less common elements.

FAT, TOTAL SOLIDS AND MOISTURE. Determinations by the "Technico" Test Unit. By R. D. Mason. London: A. Harvey. Pp. 97. 7s. 6d.

In a brief survey of the literature on this subject it appears that considerable diversity of opinion exists as to which should be adopted as a standard method for the determination of moisture, but there would appear to be some weight of opinion in favour of the vacuum oven method. In view of the confusion which exists as to what constitutes a standard the author feels that to publish comparative figures would only tend to arouse controversy amongst individual workers each justly considering the method he is using as much entitled to be judged a standard method as the one used by the author himself. The method adopted in the author's laboratories has been, in the past, the electrically-heated, thermostatically-controlled air oven and in practically every case examined, the results for moistures were higher by the vacuum oven method than by the electrically-heated oven method. In order to demonstrate the excellent reproducibility obtainable by the vacuum oven method, some actual results obtained on one or two foodstuffs are included, obtained by the methods given in the handbook. Although the methods given are directly concerned with foodstuffs, the comparatively low temperature and short time of heating should recommend the adoption of oven technique to workers in fields, such as the paint, textile and cement industries.

It will be noticed that much of the detailed instruction is repeated under each individual heading. This is done because so much time is lost by constant reference to instructions given in previous pages of a methods book, that it is felt that each particular method should be as complete as possible to prevent this constant cross reference.

Recent Trade Literature

Trailer fire pumps for A.R.P. purposes are now being made by the BRYAN DONKIN CO., LTD., Chesterfield, who have recently issued a leaflet describing the features of the units. They include a pump of robust construction, a standard Austin engine, a reliable gas primer capable of obtaining high suction lifts rapidly without racing the engine and a trailer of strong construction which can be towed over rough ground without damage.

FELCO HOISTS, LTD., have issued an illustrated leaflet dealing with "Felco" short-headroom light weight triple gear chain blocks. The headroom and weight of these pulley blocks have been reduced to a minimum, while strength and safety have been increased to a maximum by the use of special alloys and steel. Every block is tested to 50 per cent. overload working, and 100 per cent. overload static. A Test Certificate is issued with each block.

J. H. SANKEY AND SON, LTD., have issued a new 30-page refractories catalogue amply illustrated and complete with detailed dimensions and technical matter. There are tables and guides for estimating and quantity checking and altogether the catalogue is a publication which should prove invaluable to all who use refractory materials for building or repairing linings of boilers, chimneys, furnaces, cupolas, kilns, retorts, etc. The dimensions of standard firebrick shapes, fire tiles and lumps, standard boiler seating blocks, flue covers, gas retorts, muffles and crucibles, are a few of the many subjects on which information is given.

"An Economical Process for Improving the Fastness of Direct Cotton Dyestuffs" is the title of a brochure recently issued by the Dyestuffs Group of IMPERIAL CHEMICAL INDUSTRIES. It describes the application and results of a new after-treatment process which is claimed to be very simple and economical. It involves after-treatment in a chromium salt bath; this improves the fastness of a number of direct cotton dyestuffs of the well-known Chlorazol and Durazol types to a degree which is convincingly shown by the comparative fastness tables and patterns in the brochure. The tables give the water-, washing-, perspiration-, and light-fastness values of treated and untreated dyeings of fourteen important Chlorazol and Durazol dyestuffs.

HUGH WOOD AND CO., LTD., have issued a leaflet dealing with "Cardox" which is described as "an eminently safe and useful substitute for explosives in mining coal." "Cardox" dislodges coal or other materials by the action of a spreading volume of carbon dioxide. Carbon dioxide is filled into indestructible tubes made of special high-grade alloy steel, both ends of which are sealed with screwed plugs or caps, one of these acting as the release head. A chemical element, initiated by a low tension electric current, raises the pressure of the carbon dioxide in the tube until a definite pressure is reached, when a soft steel disc at the release end of the tube ruptures, allowing the gas to escape into the strata, breaking it down along natural lines of weakness, without affecting the structure of the individual pieces or lumps.

THE COPPER DEVELOPMENT ASSOCIATION have issued a new publication (No. 33) entitled "Lead-Bronze Bearings" which was first published in German by the Deutsches Kupfer-Institut. In the preparation of the English version care has been taken to follow as closely as possible the original text. The development of lead-bronze bearings may have been accelerated in Germany to some extent by a shortage of alternative bearing materials, nevertheless they have been shown to have especially good properties, and to be particularly suitable with exacting combinations of speed and load. Copper-lead bearings have been in use in this country for a number of years, and the publication provides a useful summary of information on their properties, methods of production and application, which is likely to be of interest to all engineers concerned with bearing problems.

American Chemical Industry

Reductions in 1938 Accident Rates

ACCIDENT rates in the chemical industry in America during 1938 were well below the corresponding averages for all industries according to figures compiled by the United States National Safety Council.

Chemical companies included in the statistics had an average frequency rate of 7.93 and an average severity rate of 1.23 which, compared with 1937 figures, indicates reductions of 23 per cent., and 9 per cent. respectively. Since 1926, the reduction in the frequency rate has amounted to 75 per cent., and in severity, 38 per cent. Chemical plants have made more than average progress in reducing the frequency of accidents but, states the National Safety Council, they have not quite kept pace with the all-industries improvement in severity.

Large plants had the lowest 1938 injury rates, averaging 6.85 for frequency and 1.14 for severity; they also made the most improvement in comparison with 1937. Manufacturers of plastics had lower frequency rates than any other division of the industry, averaging 2.80. Coal tar distillers had the lowest severity rates, averaging 0.17. Coal tar distillers made the largest 1937-1938 improvement in both injury rates, reducing frequency 72 per cent. and severity 98 per cent. Reports covering 222 serious injuries occurring during the last five years show that the principal mechanical causes of such injuries were: unsafe processes and working methods, poor housekeeping, and improper guarding. Improper attitudes, particularly disobedience of instructions, were the most important personal causes. The E. I. Du Pont de Nemours Co.'s plant at Old Hickory, Tenn., holds the best known all-time no-injury record in the industry, 11,361,846 man-hours. This is also the best known record in any industry.

The 1938 injury experience of the industry is based on reports from 307 plants in which employees worked 260,522,000 man-hours during the year. The frequency rate of 7.93 is 35 per cent. below the average for all industries and the severity rate of 1.23 is 20 per cent. below the general average. In comparison with 30 major industries chemical plants ranked eighth in frequency and eighteenth in severity.

Mexican Chemicals

Production and Trade Lower Last Year

MEXICO'S production and importation of chemicals declined somewhat last year according to the office of the American Commercial Attache, Mexico City. This was due mainly to less favourable economic conditions, and to a decline in the value of the peso which increased prices and consequently reduced the country's purchasing power. The character of the country's chemical production did not change appreciably during the year and the main consuming industries, namely, the textile, medicinal, pharmaceutical and mining industries continued the same as in 1937.

While no barter arrangements affecting the chemical industry were entered into during the year, the Mexican Government was accumulating large credits in Germany from the sale of oil to that country which may be utilised in purchasing any products needed in Mexico.

The United States continued the leading source for Mexico's imports of chemicals and related products in 1938, but receipts of such materials from Germany are increasing steadily. In the first half of 1938 imports of chemicals and allied products from the United States were valued at 12,000,000 pesos against receipts aggregating 11,000,000 pesos from Germany during the same period. In the first half of 1937, imports of such products from the United States were valued at 13,250,000 pesos against 9,000,000 pesos from Germany. Other important chemical supplying countries during both periods included the United Kingdom and France.

Cadmium in Silicate Rocks

Method of Determination

IN an article in the analytical edition of *Industrial and Engineering Chemistry*, E. B. Sandell, Minnesota University, states that Fischer and Leopoldi (*Mikrochim.* Acta, 1937, *1*, 30) have shown that cadmium can be determined in the presence of zinc, lead, and certain other metals by shaking a solution containing 5 per cent. of sodium hydroxide with a solution of dithizone in carbon tetrachloride; cadmium goes into the carbon tetrachloride as the dithizonate, whereas zinc and lead remain in the aqueous phase. Use can be made of this behaviour in the determination of the minute amounts of cadmium occurring in silicate rocks.

The first steps of the method are practically the same as those in the determination of copper, zinc, and lead in rocks. The heavy metals of the sample are isolated by shaking the ammoniacal citrate solution of the decomposed rock with a carbon tetrachloride solution of dithizone. The carbon tetrachloride phase is separated and shaken with 0.01 *N* hydrochloric acid. Zinc, lead, and cadmium dithizonates are thus decomposed, and these metals go into the aqueous phase as the chlorides; copper and cobalt remain in the carbon tetrachloride. Cadmium can then be determined in the aqueous phase by Fischer and Leopoldi's method.

Cadmium Content of Magmatic Rocks

According to Goldschmidt (*Skrifter Norske Videnskaps-Akad. Oslo I. Mat. Natur. Klaise*, 1937, *4*, 32) the average cadmium content of magmatic rocks is 5×10^{-5} per cent., although he states that this value is very uncertain. According to I. and W. Noddack (*Svensk Kem. Tid.*, 1934, *46*, 173) the average value is 2×10^{-5} per cent. The few igneous rocks examined showed cadmium contents ranging from about 1 to 2.5×10^{-5} per cent., not far from the limit of the method. When a 0.5-gram sample is taken, 0.02 or 0.03 microgram of cadmium, corresponding to 5×10^{-6} per cent., can be detected with certainty.

There is a tendency for the results obtained in applying the procedure to be low but it is believed that the method is useful for showing approximate cadmium content of a rock.

Copper, zinc, lead, and cobalt do not interfere, at least not in the amounts that these elements are likely to be encountered in igneous rocks. A mixture of 2.5 ml. of 25 per cent. sodium hydroxide and 10 ml. of 0.005 per cent. pure zinc solution (corresponding to 0.1 per cent. of zinc in a 0.5-gram sample) shaken with 1 ml. of 0.001 per cent. dithizone solution gave a trace of pink colour in the carbon tetrachloride layer which was distinctly less than that produced by 0.05 microgram of cadmium.

The element most likely to give trouble is nickel. Nickel dithizonate in carbon tetrachloride solution is partially decomposed by shaking with 0.01 *N* hydrochloric acid, so that more or less nickel will go into the final solution with cadmium. If more than a very small amount of nickel is present in this solution, it will impart a brown colour to the carbon tetrachloride layer, the pink colour of cadmium dithizonate is then obscured, and the determination becomes impossible. The solution of this difficulty lies in preventing, as far as possible, the extraction of nickel from the ammoniacal citrate solution. If the solution is made barely ammoniacal most of the nickel will remain in the aqueous phase and all, or nearly all, of the cadmium will be extracted. As much as 0.03 or 0.04 per cent. of nickel may be present in the sample without causing difficulty if care is taken to avoid an excess of ammonia. Larger amounts of nickel are likely to cause trouble. Moreover, large amounts of any metal extracted by dithizone (copper, zinc, etc.) are undesirable, because the complete removal of cadmium from a large volume of carbon tetrachloride phase by shaking with 10 ml. of 0.01 *N* hydrochloric acid may be difficult. However, in most silicate rocks the quantity of metals extracted by dithizone is small.

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PERSONAL NOTES

DR. HUGH NICOL has been appointed scientific assistant to Sir E. John Russell, director of Rothamsted Experimental Station.

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MR. E. V. EVANS, chairman of the Association of British Chemical Manufacturers, has been elected chairman of the

Mr. E. V. Evans.

newly-formed Gas Research Board of the Gas Industry. It is understood that the first president of the Gas Research Board will be Sir David Milne-Watson.

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MR. GEORGE ALEXANDER WORSLEY has been appointed a director of Joseph Crosfield and Sons, Ltd., chemical and soap manufacturers, of Warrington. Mr. Worsley has held the position of secretary of the company for a number of years.

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MR. A. C. MACDIARMID, chairman of Stewarts and Lloyds, Ltd.; the EARL OF DUDLEY, chairman of the Round Oak Steel Works; and SIR JAMES LITHGOW, chairman of Steel Co. of Scotland, have been appointed directors of Richard Thomas and Co., Ltd., tinplate manufacturers, following important executive changes. Col. Sir W. Charles Wright, chairman

The Earl of Dudley.

Mr. A. C. Macdiarmid.

of Baldwins, Ltd., and Mr. S. R. Beale, chairman of Guest Keen and Nettlefolds, Ltd., have resigned from the board. SIR WILLIAM FIRTH remains chairman of the company but he has been succeeded in the managing directorship by MR. JOHN E. JAMES, chairman of the Lancashire Steel Corporation.

MR. A. K. REDFORD has been appointed a director and sales manager of William Hoyle and Sons, Ltd., West Lancashire Soap Works, Haslingden.

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MR. D. O. JORDAN, M.Sc., A.I.C., has been appointed assistant lecturer in applied chemistry at University College, Nottingham. He succeeds Mr. A. W. Doyle, who has accepted an appointment as assistant lecturer in textile chemistry at the Manchester College of Technology. Mr. Jordan is at present chief chemist at the British Launderers' Research Association, where he has been engaged on the application of the results of pure research to industrial conditions.

OBITUARY

DR. ALFRED HARKER, F.R.S., who was well known for his work on igneous rocks, died recently at Cambridge. Dr Harker was with the Geological Survey of Great Britain (Scottish Branch) from 1895 to 1905.

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MR. H. TURNER LEA, M.Sc., borough analyst of Burton-on-Trent, died recently at Halifax. Mr. Lea was associated with the gas services during the war and worked in Government laboratories doing analytical work for the armies in France.

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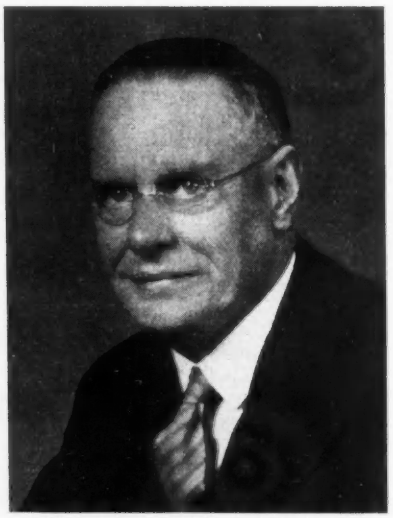
MR. ERIC P. BARFIELD, one of the founders of Wild-Barfield Electric Furnaces, Ltd., and managing director of the company since its incorporation in 1917, died on August 7. Mr. Barfield, who was elected chairman of the company in September last, was a pioneer in the electrical industry. When, in



The late Mr. Eric P. Barfield.

conjunction with Mr. L. W. Wild, he founded Automatic & Electric Furnaces, Ltd., since renamed Wild-Barfield Electric Furnaces, Ltd., he formed the first company in this country to make industrial electric heat-treatment furnaces.

MR. ROBERT DOUGLAS DANKS, late manager of the Broxburn Oil Works of Scottish Oils, Ltd., has left personal estate valued at £2,161.

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MR. JOHN WILLIAM YOUNG, former chief chemical inspector of the Department of Health for Scotland, has left net estate of the value of £26,586.

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MR. JOHN PATERSON, of John Paterson and Co., Ltd., chemical manufacturers, Clensel Works, Bridgeton, Glasgow, has left net estate valued at £25,907.

General News——From Week to Week

THE SECRETARY FOR MINES announces the expiry of two prospecting licences granted to the Anglo-American Oil Co., Ltd. The areas concerned are in Sussex and Southampton.

THE TENTH ANNUAL REPORT of the Imperial Bureau of Soil Science published this week refers to the control of root-infecting fungi, and in discussing the role of fungi in the soil a return from the present highly artificial systems of crop cultivation is predicted as a means of preserving the biological fertility of the soil.

TWO LAYERS OF heavy kraft paper, two layers of bitumen, and two layers of crossed sisal fibres go to the making of what is claimed to be the ideal window blind for air-raid requirements. The product of a new industry in Kent, this blind is being exhibited during the next few weeks at the Scottish Building Centre in Sauchiehall Street, Glasgow.

THE EXTENSION OF THE AREA of a licence for prospecting for petroleum granted to the Gulf Exploration Company (Great Britain), Ltd., was announced on Saturday by the Secretary for Mines. The additional area consists of 18 square miles in Yorkshire. The area previously licensed consisted of 153 square miles in Yorkshire, including the Cleveland Hills.

FOLLOWING THE ANNOUNCEMENT that the Crown Agents for the Colonies had placed a contract valued at £94,950 with Stewarts and Lloyds, Ltd., for the supply of pipelines in connection with the Ceylon hydro-electric schemes, it was learned recently that there was a possibility of an additional furnace being put into operation at the firm's Clydesdale Steelworks, Mossend, Lanarkshire.

ATTRACTED by the presence at Afton of a thick gas coal reputed to yield 40 gallons of oil per ton, the Coal Oil Development Co., London, is erecting an oil distillation plant. The pilot plant will deal with 50 tons a day, but it is hoped to increase this eventually to 300 tons or more. The process used will be the Freeman, in which the distillation and "cracking" of the products are carried out simultaneously in one retort.

FIRE WHICH BROKE OUT at the works of the Midland Acid Co., Ltd., at Pye Bridge, last week, caused considerable damage. The wooden framework round one of the lead tanks holding hundreds of gallons of acid caught fire and there was great danger of the fire spreading to Messrs. Kempson's chemical works, which adjoin, and where naphtha, creosote, and light oils are made and stored. The fire started in a purifying plant which was erected recently by the Butterley Co. and has not yet been put into use. Two new "Glover" towers, about 80 feet high, were destroyed.

SPEAKING BEFORE Durham City Rotary Club on the present economic position of the world, Professor A. W. Nash, of Birmingham University, said that plants for the hydrogenation of coal could only be classed as a most extravagant form of public working costing £1,300 in capital for each man working and involving an annual subsidy of £280 per man. Professor Nash said it had been stated that petrol produced by hydrogenation would cost at least 11d. per gallon to produce, compared with 4d. a gallon for imported petrol. A hydrogenation plant producing 150,000 tons of petrol per annum would cost £8,000,000 to build, and in order to meet motor spirit requirements alone 32 of these plants would be needed.

THE AUTUMN MEETING of the Iron and Steel Institute will be held in Cardiff from September 12 to 15, 1939, by the kind invitation of the iron and steel industries of Cardiff and the district. A reception committee has been formed in order to carry out the arrangements for the meeting, with Mr. J. S. Hollings as chairman, Mr. D. J. Young as hon. treasurer and Mr. W. F. Cartwright as hon secretary. A technical session will be held on September 12 in the Lecture Theatre of the South Wales Institute of Engineers, Cardiff, and the subsequent arrangements include visits to iron and steel works in Cardiff, Ebbw Vale and Newport, excursions in the surrounding neighbourhood and social entertainments.

THE SHELL UNION OIL CORPORATION recently announced an $8,000,000 programme for expansion and modernisation of its refinery at Wood River, Illinois. This will increase the capacity of the crude oil refinery from 50,000 to 75,000 barrels daily.

ACCORDING TO THE Rubber Market Review issued by Charles Hope and Son, the improvement in world consumption of rubber, which commenced in the last quarter of 1938, has been fully maintained and consumption for the first half of this year was 532,000 tons, an average of 88,700 tons per month, compared with 72,800 per month during the corresponding period of 1938, when it totalled 437,000 tons. So far this year, therefore, consumption has been at the rate of 1,064,000 tons per annum, a figure which is not far short of that for 1937, when 1,105,000 tons were consumed. The U.S.A. were responsible for the whole of the increase.

Foreign News

THE USE OF SODIUM BENZOATE as a preservative for canned tomatoes has been prohibited by the Hungarian Ministry of Agriculture.

A SPECIAL PLANT for the production of sulphuric acid from sulphur-containing gases has been installed at the Baelen works of the Soc. des Mines et Fonderies de la Vieille Montagne.

ITALIAN PRODUCTION of chemical pulp for the textile and paper industries in the first four months of this year totalled 16,074 tons, against 13,954 tons in the corresponding period of last year.

DESTRUCTION OF INSECT PESTS with sulphur hexafluoride (SF_6) has been proposed by a Hungarian inventor. It is fatal to insects in 1 per cent. concentration after 24 hours and in 2 per cent. concentration after 5 hours, while it is believed to be entirely harmless to human beings.

SWEDISH PRODUCTION OF LIQUID RESIN (a by-product of the pinewood pulping industry) has increased to a marked degree, largely owing to the demand from Germany where it is used after further processing as a cheap substitute for linseed oil in the paint industry. The 1937 production of 18,000 tons (12,700 tons in 1936) was entirely taken by Germany.

SOYA BEANS are being cultivated on an increasing scale in Jugo-Slavia, mainly for the purpose of supplying the German market under the terms of the 1931 commercial agreement. The industry is centred in the German-owned Uljarica Company which has now planted the bean over an area of 12,000 yokes, a sharp increase over the 1,000 yokes of 1936. Hamburg is the centre for processing.

A NEW ITALIAN process for the production of motor spirit of high octane value, developed by Natta and Baccaredda (La Chimica e l'Industria, July 1939, p. 393), is based upon polymerisation of isobutylene under the simultaneous influence of a gaseous and a solid catalyst. The most effective gaseous catalyst is hydrochloric acid gas, while some form of alumina, e.g., pure aluminium oxide, calcined bentonite or kaolin is recommended as the solid catalyst. Among the advantages of the process are the possibility of operating at a low temperature, the selective dimerisation of isobutylene even in presence of other olefines and the ease of regeneration of the alumina.

PROGRESS IN THE DEVELOPMENT of new processes for utilisation of coal is described in the report for 1938 of the Gesellschaft für Kohlentechnik m.b.H. of Dortmund-Eving. Experiments are proceeding with the object of combining the two leading hydrogenation methods of Bergius and Fisher-Tropsch, the main point here arising being whether the yield of liquid products during coking and slow carbonisation can be increased by preliminary pressure hydrogenation of the coal in the absence of catalyst or solvent. Other problems under examination concern oxidation at low temperatures, the manufacture of hydrogen ion exchangers, the working-up of coke oven ammonia to sulphuric acid-free ammonium compounds and production of benzene of specially high quality. A process has been evolved for the manufacture of plastics from ammonium thiocyanate. An experimental plant is under construction for the manufacture from a mixture of coke oven gas and blast furnace gas of a methane which is only diluted with nitrogen and can be readily chlorinated.

Weekly Prices of British Chemical Products

TRADE in the general chemical market is somewhat restricted this week and a holiday atmosphere is in evidence. Nevertheless, there is a fair interest in those items normally receiving a day to day demand, and movements so far as ex contract deliveries are concerned are exceedingly good. The convention scale of prices for red lead and white lead has been raised by £1 per ton, the increase dating from August 4. Quotations elsewhere are unchanged with a firm undertone prevailing. In the Coal Tar section conditions remain inactive with little fresh business in circulation.

Price Changes

Rises: Copper Sulphate (Manchester); Lead Acetate, white crystals; Lead, red; Litharge (Glasgow); Naphthalene, crude, whizzed or hot pressed.

MANCHESTER.—Holidays have had a distinctly quietening effect on business on the Manchester chemical market during the past week, fresh buying as well as contract deliveries having been on a smaller scale. An early improvement, however, is looked for. Apart from a stiffening of values of metal products as a result of the advance in the non-ferrous metals market, little change has been shown in chemical prices, which are generally on a steady basis. With regard to the by-products pitch remains slow, but there has been a fair movement of benzol and other light distillates, quotations for which are firm.

GLASGOW.—Business in general chemicals has been rather quiet during the week, on account of holidays in so many districts. Prices, however, continue very firm at about previous figures, with an upward tendency in the prices of metal products.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech., glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE (see Salammoniac).—Firsts, lump, spot, £42 17s. 6d. per ton; d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

AMMONIUM DICHROMATE.—8¼d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £10 10s. per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £15 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. GLASGOW: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16 per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £13 per ton d/d station in drums.

CHROMIC ACID.—9d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. GLASGOW: B.P. crystals, 1s. 0¼d. per lb; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in bags. MANCHESTER: £18 17s 6d. per ton f.o.b. GLASGOW: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, £4 12s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. MANCHESTER: White, £31; brown, £30. GLASGOW: White crystals, £30; brown, £1 per ton less.

LEAD NITRATE.—£27 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. GLASGOW: £30 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—GLASGOW: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. GLASGOW: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P., 5s. 1d.; chloride B.P. (calomel), 6s. 2d.; red oxide cryst. (red precip.), 7s. 6d.; levig, 6s. 9d.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. MANCHESTER: £49 to £55 per ton ex store. GLASGOW: £2 9s. per cwt. in casks.

PARAFFIN WAX.—GLASGOW: 3¾d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. MANCHESTER: £37 per ton. GLASGOW: 4¼d. per lb.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. GLASGOW: 5¼d. per lb., net, carriage paid.

POTASSIUM CHROMATE.—7d. per lb., d/d U.K.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—LONDON: 9¼d to 10¼d. per lb. MANCHESTER: B.P. 9¾d. to 11¼d. GLASGOW: B.P. Crystals, 10½d.

POTASSIUM PRUSSIATE.—6d. to 6½d. per lb. MANCHESTER: Yellow, 6d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. MANCHESTER: £10 15s. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.
SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts. GLASGOW: 4¼d. per lb., carriage paid.
SODIUM CHROMATE.—4½d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d. GLASGOW: £1 12s. per cwt. in 1-cwt. kegs, net, ex store.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.
SODIUM PRUSSIATE.—4d. per lb. for ton lots. MANCHESTER: 4¼d. to 5d. GLASGOW: 4d.
SODIUM SILICATE.—£8 2s. 6d. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 10s.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.— 1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1½d. per lb., 5%, ex store.
ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2-cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7½d. to 1s. 2½d. per lb., according to quality. Crimson, 1s. 6½d. to 1s. 8d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—3s. 1d. to 3s. 4d. per lb.
CARBON BLACK.—3⅜d. to 4 1/16d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 11½d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5d. per lb.; dark 3⅜d. to 4⅜d. per lb.
LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1940; September, £7 5s.; October, £7 6s. 6d.; November, £7 8s.; December, £7 9s. 6d.; January, 1940; £7 11s., February £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1940; September £8 2s. 6d.; October £8 3s. 9d.; November £8 5s.; December, £8 6s. 3d.; January, 1940, £8 7s. 6d.; February £8 8s. 9d.; March £8 10s.; April/June, £8 11s. 3d.
NITRO-CHALK.—£7 10s. 6d. per ton up to June 30, 1940.
SODIUM NITRATE.—£8 5s. per ton for delivery up to June 30, 1940.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9. MANCHESTER: Crude, 1s. 0½d. to 1s. 0⅝d. per gal.; pure, 1s. 8d. to 1s. 8½d. per gal.; motor grade 1s. 6½d.
CARBOLIC ACID.—Crystals, 6⅝d. to 7⅛d. per lb., small quantities would be dearer; Crude, 60's 1s. 7d. to 1s. 10d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.
CREOSOTE.—Home trade, 3¾d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 3¼d. to 4½d.
CRESYLIC ACID.—97/99%, 1s. 5d. to 1s. 8d.; 99/100%, 2s. to 2s. 6d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 1s 5d. to 1s. 6d.
NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 5d. to 1s. 7d. per gal.
NAPTHALENE.—Crude, whizzed or hot pressed, £6 to £6 10s. per ton; purified crystals, £9 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £10 10s. to £11 10s. 0d. per ton f.o.b.
PITCH.—Medium, soft, 26s. per ton, f.o.b. MANCHESTER: 24s. f.o.b., East Coast.
PYRIDINE.—90/140%, 12s. 6d. to 14s. per gal.; 90/160%, 10s. 6d. to 11s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. MANCHESTER: 10s. 6d. to 13s. 6d. per gallon.
TOLUOL.—90%, 2s. 1d. to 2s. 2d. per gal.; pure 2s. 5d. to 2s. 6d. MANCHESTER: Pure, 2s. 5d. per gallon, naked.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. MANCHESTER: 2s. 4d. per gallon.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Brown, £8; grey, £9 10s.
METHYL ACETONE.—40.50%, £32 to £35 per ton.
WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.— 2s. 8d. to 3s. per gal;. solvent, 3s. to 3s. 5d. per gal.
WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—1s. 10d. per lb., for cwt. lots, net packages.
BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL 34/35° C.— 1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.
DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.
DIPHENYLAMINE.—Spot, 2s. 3d. per lb.; d/d buyer's works.
GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.
H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.
NAPHTHIONIC ACID.—1s. 10d. per lb.
β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
a-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
o-NITRANILINE.—4s. 3½d. per lb.
m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8⅜d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON, Aug. 9.—LINSEED OIL was firm. Spot, £27 per ton (small quantities); Aug., £24 10s.; Sept.-Dec., £23 17s. 6d.; Jan.-April, £23 5s., naked. SOYA BEAN OIL was dull. Oriental, Aug.-Sept. shipment, c.i.f. bulk, £17 10s. per ton. RAPE OIL was quiet. Crude, extracted, £31 10s. per ton; technical, refined, £32 15s., naked, ex wharf. COTTON OIL was unchanged. Egyptian crude, £17 per ton; refined common edible, £20; deodorised, £22, naked, ex mill (small lots £1 10s. extra). TURPENTINE was easier. American, spot, 32s. 9d. per cwt.; Aug. delivery 32s. 6d.
HULL.—LINSEED OIL, spot, £25 2s. 6d. per ton; Aug., £24 10s.; Sept., £24 5s.; Oct.-Dec., £24. COTTON OIL, Egyptian, crude, spot, £16 per ton; edible, refined, spot, £19; technical, spot, £19 deodorised, £21, naked. PALM KERNEL OIL, crude, f.m.q., spot, £17 per ton, naked. GROUNDNUT OIL, extracted, spot, £23 per ton; deodorised, £26. RAPE OIL, extracted, spot, £30 10s. per ton; refined, £31 10s. SOYA OIL, extracted, spot, £25 10s. per ton; deodorised, £28 10s. COD OIL, f.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL, pharmaceutical, 39s. per cwt.; first, 34s.; second, 32s. TURPENTINE, American, spot, 34s. 3d. per cwt.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ENGLISH CLAYS LOVERING POCHIN AND CO., LTD., St. Austell. (M., 12/8/39.) July 28, £20,000 mortgage to Tehidy Minerals, Ltd.; charged on Blackpool China Clay Works and Burngullow China Clay Dries, St. Mewan, etc. *£382,030. Jan. 25, 1939.

MIDLAND TAR DISTILLERS, LTD., Birmingham. (M., 12/8/39.) July 28, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£180,000. Nov. 24, 1938.

R. J. HAMER AND SONS, LTD., Mitcham, paint manufacturers. (M., 12/8/39.) July 26, charge, to Lloyds Bank, Ltd., securing all moneys due or to become due to the Bank; charged on premises at Miles Road, Mitcham. *£2,139. Sept. 24, 1939.

RICHARD THOMAS AND CO., LTD., London, W.C., tinplate manufacturers. (M., 12/8/39.) July 27, charge supplemental to Trust Deed dated July 29, 1938; charged on various properties, etc., and certain shares. *£8,620,410. Aug. 11, 1938.

Declarations of Solvency Filed

G. RUTH, LTD., Liverpool, paint manufacturers. (D.S.F., 12/8/39.) July 26.

IMPREX, LTD., Liverpool, paint manufacturers. (D.S.F., 12/8/39.) July 26.

Company News

The International Nickel Corporation have declared a dividend of 50 cents per share on the common stock.

George Kent, Ltd., report for the year to March 31 last, trading profit, dividends, etc., of £55,137 (£56,166), less depreciation £7,206 (£6,958), directors' fees £467 (£463), premiums on policies for redemption of premises £388 (same), balance written off investment in subsidiary company £1,315 (£1,906), tax £1,202 (£1,373), N.D.C. £1,400 (£1,750), and debenture interest £9,552 (£8,006), leaving £33,607 (£31,523). Sum of £1,500 is put to employees' assurance scheme (£1,250), to dividend equalisation reserve £5,000 (same), to directional and staff participation fund £2,500 (nil), dividend 10 per cent. (same), bonus 2½ per cent. (centenary bonus 3½ per cent.), forward £41,391 (£43,093).

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Poland.—A firm in Katowice whose representative is at present in London wishes to obtain the representation, on a buying basis, of United Kingdom producers or suppliers of fine chemicals, oxygen, molybdic acid, ammonium sulphate, hydrofluoric acid, caustic soda, caustic potash, pig iron, tin, cobalt, nickel, steel dust or grit, graphite, fluorspar, palm oil, wool grease. (Ref. No. 621.)

Argentina.—A well-established agent at Buenos Aires wishes to obtain the representation for Argentina of United Kingdom manufacturers of chemical products (sulphates, potashes), acids (citric, formic, acetic, lactic, etc.), china clay, chalk, calcium carbide, coconut oil, etc. Applicant would work on a commission basis. (Ref. No. 633.)

Australia.—A firm of agents established at Sydney wishes to obtain the representation, on a purchasing basis, of United Kingdom manufacturers of various types of fluorescent (ultra-violet) materials, luminous paint pigments and radio-active materials for the whole of Australia. (Ref. No. 635.)

Chemical and Allied Stocks and Shares

IN the absence of improvement in business on the Stock Exchange, movements in industrial and other securities were moderately reactionary this week. There was, however, little selling in evidence, but sentiment was again dominated by the obscure international position.

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Securities of chemical and associated companies were slightly lower in sympathy with the surrounding trend in the stock and share markets. Imperial Chemical were 29s. 1½d. compared with 29s. 7½d. a week ago, but the preference units were slightly better at 29s. 10½d., compared with 29s. 9d. Courtaulds were a few pence lower at 30s. 6d., and British Celanese and other rayon shares also showed movements against holders following their recent rally. British Match were moderately higher at 34s. 9d., while Lever and Unilever at 34s. were unchanged on balance. International Paint moved against the prevailing market tendency, and were 81s. 3d. compared with 80s. 7½d. a week ago, but Pinchin Johnson went back from 23s. to 22s. 3d. awaiting declaration of the interim dividend which is expected towards the end of the month.

* * * *

Fison Packard at 41s. 3d. were a relatively steady feature, but were less active this week, as were B. Laporte, which, however, remained around 61s. British Oil and Cake Mills preferred ordinary were maintained at 40s., but Swedish Match were lower at 23s. 9d. Most shares with an international market were inclined to make reduced prices, and International Nickel failed to respond to the maintenance of the quarterly dividend. United Glass Bottle were quoted at 50s., but were inactive. On the other hand, Triplex Glass fluctuated in advance of the dividend announcement, and on balance showed a decline from 37s. to 36s. British Aluminium reacted from 58s. 3d. to 57s. 6d., the view having gained ground that all question of an increased distribution is likely to be left until the final dividend.

* * * *

Dunlop Rubber also went back following last week's improvement and changed hands around 28s. 9d. Michael Nairn, however, were 54s. 4½d., and have more than held their recent gain, while Wall Paper deferred units were better at 25s. United Molasses were 6d. down at 24s. British Glues continued to attract rather more attention, but were slightly lower at 4s. 9d. as were the participating preference shares at 24s. 4½d. Cellon ordinary, however, remained at 15s. 6d. British Industrial Plastics at 1s. 6d. and Low Temperature Carbonisation at 1s. 7½d. were little changed, while General Refractories were again 7s. 3d. and Imperial Smelting transferred around 9s. 9d.

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Among iron and steel securities a fair amount of attention continued to be given to Stewarts and Lloyds and Stanton Iron, which at 44s. 1½d. and 53s. 9d. were little changed on balance. Baldwins were well maintained, partly on hopes of an interim dividend, while Richard Thomas shares and debentures had a steadier appearance. On the other hand Guest Keen went back from 25s. 3d. to 24s. 9d. and rather lower prices also ruled for United Steel and Consett Iron. Babcock and Wilcox were unchanged on balance at 47s., but Pressed Steel at 18s. 9d. lost part of their recent rally. Blythe Colour Works ordinary were 7s. 6d. compared with 7s. 9d. a week ago.

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Boots Drug at 42s. 10½d. were virtually the same as a week ago, and other shares of companies which it is assumed are well placed to benefit from the expected improvement in the spending power of the public were also relatively steady. Timothy Whites and Taylors were 22s. 4½d., while Sangers were 20s. 6d. and British Drug Houses 21s. 3d. Beechams Pills deferred remained around 8s. 3d. Declaration of the interim dividend of the last-named company is anticipated early next month.

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In other directions Monsanto Chemicals 5½ per cent. preference were again 21s. 10½d., and Greeff-Chemicals Holdings ordinary units transferred around 5s. 7½d. Newton Chambers were 41s. 6d. at Sheffield. Anglo-Iranian, "Shell" and other oil shares again moved closely with the day-to-day trends of the Stock Exchange.